Preventive Health Services Use, Medical Mistrust, Cancer and African American Men:
A Secondary Data Analysis and Systematic Review

By

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Abstract of Master's Paper

Background

African American men are at increased risk for cancer incidence and mortality. Cancer related risk factors; such as tobacco use and obesity are associated with several cancers, including colorectal cancer. Moreover, high rates of tobacco use and obesity among African American men, along with receipt of fewer preventive services likely intensifies the disparity of cancer morbidity and mortality. African American men with higher levels of medical mistrust have been found to both schedule and receive fewer preventive services, including the routine health examination. Evidence that explores the relationship between the routine health examination, cancer related risk factors and medical mistrust is scant.

Accordingly, compared to all other US adults, incidence and mortality rates of colorectal cancer are highest among African American men while adherence to screening remains low. There is growing data that adherence among African American men may be higher than previous estimates. No consensus on guideline consistent colorectal cancer screening adherence among African American males is currently available. Therefore, this paper both explores factors associated with preventive health service use, and reviews the relevant literature on adherence to colorectal cancer screening among African American men.

Methods

This paper includes both a secondary data analysis which explores the association between the routine health examination, cancer related risk factors and medical mistrust among African American men and a systematic review of colorectal cancer screening adherence among African American men. The Theory of Reasoned Action served as the conceptual framework for the data analysis. Bivariate and multivariate analyses assessed unadjusted and adjusted

associations. PubMed (Medline), EMBASE and CINAHL databases were searched for all relevant articles on colorectal cancer screening adherence among African American men.

Results

African American men who received a routine health examination within the last year had higher body mass indices than men who did not receive an examination (B=1.38, p=0.024, 95% CI 0.16-2.59). There was no association between smoking status and receipt of a routine health examination (OR= 1.24, p=0.452, 95% CI 0.71-2.18) and medical mistrust did not moderate the relationship between the routine health examination and either smoking status (p=0.535) or body mass index (p=0.60).

A review of 125 titles and seven eligible articles, revealed that there was significant heterogeneity in the study populations, methods, results, and quality of studies, as well as a lack of objective data, examining adherence to colorectal cancer screening among African American men.

Conclusions

Receipt of a routine health examination is associated with having a higher body mass index, but not with smoking status. In addition, these relationships were not moderated by medical mistrust. Consistent, objective, high quality, nationally representative data, examining true adherence to colorectal cancer screening among African American men is currently unavailable.

Original Research Paper

Routine Health Examinations, Medical Mistrust, and Cancer Related Risk Factors Among African American Men

Abstract

Background

African American men are at increased risk of cancer incidence and mortality. The association between cancer and modifiable lifestyle factors is clear. Evidence has shown that norms and attitudes, including medical mistrust are associated with scheduling and receipt of routine health examinations among African American men. However, evidence that explores the relationship between preventive health care and medical mistrust, as they relate to cancer related risk factors is scant.

Methods

This cross-sectional secondary analysis of data collected from a larger study of African American Men's Health and Social lives uses the Theory of Reasoned Action as the conceptual framework to examine the relationship between medical mistrust, routine health examinations, current smoking status and body mass index. Independent variables included receipt of a routine health examination within the past year and level of medical mistrust. Dependent variables included current smoking status and body mass index. Age, socio-demographic characteristics, health care access, and health status were controlled for in all analyses. Pearson's Chi-square, two-sample t-test, one way ANOVA, linear regression and multivariate logistic and linear analyses were used to examine bivariate and multivariate relationships. Effect modification between receipt of a routine examination and medical mistrust was also assessed.

Results

African American men who received a routine health examination within the last year had a slightly higher body mass index than men who did not receive an examination (B=1.38, p=0.024, 95% CI 0.16-2.59). There was no significant association between current smoking status and receiving a routine health examination in the past year (OR= 1.24, p=0.452, 95% CI 0.71-2.18). Medical mistrust did not moderate the relationship the routine health examination and either smoking status (p=0.535) or body mass index (p=0.60).

Conclusion

Some cancer related risk factors are associated with receipt of a routine health examination. African American men who received a routine health examination within the last year had higher body mass indices than men who did not receive a routine examination in the past year. Current smoking status is not associated with receipt of a routine health examination within the last year. Medical mistrust did not moderate the relationship between receiving a routine health examination in the last year and either cancer related risk factor.

Introduction

African American men account for a disproportionate share of cancer morbidity and mortality within the United States. Between 2004-2008, the incidence of cancer from all sites among African American males was 626.2 per 100,000 compared to 545 per 100,000 among White males (1). Further, the incidence of lung cancer among African American males was 102.7 per 100,000 compared to 83.7 for non-Hispanic White males(1). Rates of colorectal cancer incidence and mortality were 66.9 and 30.5 per 100,000 in African American males and 54.6 and 20.1 per 100,000 respectively, in non-Hispanic White males(1). The relationship between modifiable lifestyle factors and malignancy is clear (2, 3). Both lung cancer and colorectal cancers are linked with tobacco use and obesity, respectively (4, 5). Compared to non-Hispanic White males, African American males have higher rates of obesity (6), and tobacco use among African American males exceeds the national average (7).

Receipt of preventive care can help address these cancer related risk factors. Despite evidence that access to care improves receipt of preventive services (8), men are less likely to use preventive health services (9). Moreover, African American men attend fewer preventive care visits than non-Hispanic White men (10).

Routine health examinations, though not the only means of care, serves as a primary method to receive clinical preventive services, risk assessment, and behavioral counseling. Routine health examinations are associated with increased cholesterol screening, fecal occult blood testing and decreased patient worry (11). Therefore the routine health examination may serve as a critical access point for African American males to receive preventive services and address risky behaviors.

Though evidence supports a significant relationship between medical mistrust and delayed receipt of the routine health examination (10), the association between the periodic examination, medical mistrust and specific cancer related risk factors has not been examined. Therefore, we aim to explore health behavior and health care utilization among African American men-a high-risk population.

We hypothesize that receipt of a routine health examination is associated with being a non-smoker, and having a lower body mass index. Theoretically, men with higher levels of mistrust are engaged in fewer health promoting and disease preventive behaviors, and thus are more likely to have a less favorable cancer related risk factor profile, therefore, we also hypothesize that the relationship between the routine health examination, tobacco use and body mass index is moderated by level of medical mistrust.

Methods

Guiding Behavioral Framework

We use the Andersen Behavioral Model of Health Services Use (12), and the Theory of Reasoned Action as guiding theoretical frameworks for this secondary analysis (13). The Andersen model posits that health care service is a function of predisposing (e.g. sociodemographic), enabling (e.g. economic, social relationships), and need (perceived and evaluated health) factors. Further, the Theory of Reasoned Action adds to this framework by proposing that behavioral intentions, which are the determinants of behavior, are a result of individual attitudes, and subjective norms (13). In this study, receipt of a routine health examination is used as an indicator of health behavior intention, while medical mistrust represents contributing attitudes. In this study we examine the relationship between both of these factors, receipt of a routine health examination (behavioral intention) and medical mistrust (individual attitude), on specific health risk factors (tobacco use and body mass index).

Study Participants

We obtained data collected from a larger cross-sectional study of African American men's Health and Social lives (10). Survey data was retrieved in three waves from 2003-2004 and 2007-2009. Participants were recruited from seven barbershops, two academic institutions and one academic event in five geographically diverse locations (Michigan, Georgia, California, North Carolina, and Florida). Academic institutions included one community college (Southeastern Michigan) and one historically Black university (central North Carolina) of varying size and student population demographic. A conference for African-American male law enforcement professionals in Miami, FL, served as the academic event.

Recruitment and Research Settings

We recruited participants using flier advertisements, direct contact and word of mouth. As trusted congregating spaces for African-American men, barbershops were chosen as primary recruitment sites (14, 15). Traditionally, they serve men from varied socioeconomic backgrounds and have been utilized successfully for health promotion interventions involving this population(14, 15). Eight barbershops described as "high volume" businesses (i.e., having a wait time of 30-60 minutes and serving a minimum of 30 customers per day) by key African American male informants in the community were approached about participation. "High volume" shops were preferred as men could use their wait time to complete the surveys.

Study brochures, copy of the survey and consent forms were provided to owners. Seven out of eight barbershops provided consent and participated in the study. Thereafter, signed letters of support were obtained from all barbershop owners. Receptionists or barbers invited self-identified African American male patrons aged 18 years or older to participate in " a study about African-American men's health." Ninety percent of men asked verbally consented to participate.

Time constraint was the most frequently reported reason to decline participation. Patrons were given the option of submitting the survey at a later date, however most participants completed the survey on-site during their wait time. All participants received a $25 gift certificate for a free haircut. Similar procedures were used at academic institutions and an event. African American research assistants approached potential participants during meal times or breaks in areas of high congregation (e.g., cafeterias, student unions, conference exhibit halls). Eighty-six percent of men approached at academic institutions and an event completed the survey and received a $25 gift card. The University of North Carolina at Chapel Hill and University of Michigan institutional review boards approved all study procedures.

Measures

Outcome Variables (Cancer Related Risk Factors)

Smoking status was measured with one single-item question about smoking behavior: “Do you currently smoke?”

Body mass index (BMI) was calculated using self-reported height and weight measures. Height measurements were self-reported in feet and inches, and weight reported in pounds. Participants responded to the following questions: “How tall are you without shoes?” and “How much do you weigh without shoes?” BMI was calculated using this height and weight data with the assistance of an online BMI calculation tool. This tool calculates body mass index using weight in pounds and height in feet and inches (16).

Main Independent Variable

Routine Health Examinations

To measure receipt of a routine health examination, participants were asked “About how long has it been since you had a routine check-up by a doctor or other health professional?”

Response options were as follows: (1= Within the past year, 2=Within the past 2 years, 3=Within the past 3 years, 4=Within the past 5 years, 5=More than 5 years, and 6=Never). Responses were dichotomized into 0=Delay and 1=No Delay (receipt of a routine check up in the past year), as men with no delay in receiving a routine checkup were the group of primary interest.

Moderator Variable

Medical Mistrust

Medical mistrust was measured with the 14-item Medical Mistrust Index (MMI) which measures individual mistrust in healthcare organizations as a whole (e.g. "Healthcare organizations are more concerned about making money than taking care of people") (17). Six items were coded in reverse and responses ranging from 1 ("strongly disagree") to 4 ("strongly agree") were used to compute a mean score (Cronbach's alpha=0.78 Higher scores in this scale indicate a greater level of individual mistrust in healthcare organizations.

To assess effect modification, we also created an interaction variable calculated from the multiplication of our two primary predictor variables (receipt of a routine health examination and medical mistrust).

Control Variables

Socio-demographic variables included age (18-29, 30-39, and ≥40), education (≤ high school, some college, and college graduate/professional degree), marital status (currently married or unmarried), and site of survey completion (educational institution or barbershop). Age and education were coded as single indicator variables. Enabling factor measures assessed health insurance status (has health insurance vs. no health insurance), and usual source of care (has a usual source of care vs. no usual source of care).

To measure need factors, including physical health status and the presence of chronic health conditions, an additional variable, “chronic health conditions” was created. Participants were asked if had they had ever been told by a doctor or other health professional that they had any of twelve health conditions (e.g., hypertension, coronary heart disease, angina, heart attack, heart disease or heart condition, stroke, emphysema, asthma, ulcer, cancer or malignancy, diabetes or sexually transmitted disease). Responses were coded as 0=No and 1=Yes. An aggregate score of the number of chronic health conditions was calculated and then regrouped into the dichotomous variable, chronic health condition (0 chronic health conditions or 1 or more chronic health condition (s)).

Statistical Analysis

We performed univariate analyses to describe characteristics of our sample. Pearson’s chi-square, two-sample t-tests, one way ANOVA, linear regression and binary logistic regression tests were used to measure unadjusted bivariate associations between independent and dependent variables.

Multivariate regression (binary logistic and linear) analyses examined the relationship between all sample characteristics, smoking status and body mass index (respectively). Main exposure variables included having a routine check up within the past year, and mean medical mistrust scores. We adjusted for age, education, marital status, recruitment site, health insurance status, usual source of care, and the presence of chronic health conditions in each fully adjusted model.

Two models (multivariate logistic and linear regression) measuring the interaction between the routine health examination, medical mistrust and either smoking status or BMI, respectively,

examined the relationships between the interaction variable, primary predictors and outcome variables.

Adjusted odds ratios (ORs), unstandardized coefficients (B), 95% confidence intervals (CI), and corresponding significance tests (p-values) were calculated for all models.

Variance inflation factor (VIF) values of less than 5 confirmed the absence of multicollinearity among all independent variables. We conducted the Hosmer Lemeshow test to evaluate the quality of the multivariate logistic regression model and goodness of fit. The model was found to have good fit as indicated by non-significant ($p>0.05$) values. We calculated Pseudo-$R^{2's}$ (Cox-Snell and Nagelkerke) to evaluate the variance explained by the multivariate logistic model. R^2 and adjusted R^2 were calculated to explore the variance explained in the multivariate linear regression model. Perfect model fit is indicated at a value of 1 and no fit at 0.

Missing data analysis demonstrated that data were missing completely at random. We used multiple imputation procedures to create five complete data sets (18).

In bivariate analyses, tests of significance (p-values) were not available for the final pooled data set; therefore p-values are reported in ranges, representing results from all five complete datasets. If significance tests were identical between all five datasets, one p-value is reported. Odds ratios, unstandardized coefficients and 95% confidence intervals were obtained for logistic and linear regression models, respectively for the final pooled data set and all five datasets, independently. Pooled regression model results are presented here.

All statistical analyses were performed with Statistical Package for Social Sciences (SPSS for Windows, Release 19 and SPSS for Mac, Release 20), and 2-tailed tests were considered significant at the 0.05 alpha level.

Results

Descriptive Characteristics

Participant characteristics are presented in Table 1. Most men were between the ages of 18 and 29 (57.9%) with a mean age of 30.7 years. More men had some college education (45.3%) compared to those having a high school education (26.1 %), being a college graduate or having a professional degree (28.6%). There were more unmarried (73.4%) men and men who were recruited at a barbershop (65.9%). Most men had both health insurance (62.2%) and a usual source of care (54.9%). Further, the majority of participants reported having one or more chronic health conditions (70.2%).

Most men were not current smokers (73.4%). The mean body mass index for study participants was 27.5 kg/m^2, and ranged from 18.9 to 50.3 $kg/m^{2.}$ Most men in the study sample had received a routine health examination in the last year (73.1%) (i.e. had no delay) and the mean level of medical mistrust was 2.54 (SD range +/- 0.35-0.36). Medical mistrust is measured as an average of 14 items on a 4-point Likert scale. Therefore, a mean level of medical mistrust of 2.54 (+/- 0.35-0.36), indicates a moderate level of mistrust.

Unadjusted Associations between Primary Predictors and Cancer Related Risk Factors

In regards to the primary predictor, receipt of a routine health examination in the last year, the majority of men who had received a routine health examination were non-smokers (74.4%). Among men who did not have a routine health examination, 70.3% were not current smokers.

These differences were not statistically significant (p=0.26-0.52). Mean medical mistrust was also not associated with smoking status (Table 2).

Both age and education were significantly associated with smoking status, with 82.7% of men over the age of 40 reporting being a current non-smoker, compared to 68.2% of men between 18-29 years of age (Table 2). Most men with college or graduate degrees were not current smokers (86.0%), compared to 60.9% of men with a high school education or less (Table 2). Marital status was significantly associated with smoking status. Eighty-seven percent of married men reported being non-smokers compared to less than 70% of unmarried men (Table 2).

There was no association between recruitment site and current smoking status.
Having both health insurance and a usual source of care were significantly associated with smoking status. Eighty percent of men with health insurance were non-smokers, whereas only 62.5% of men without health insurance reported being non-smokers. Further, more men with a usual source of care were reportedly non-smokers (77.8%), compared to those without a usual source of care (67.9%). Having one or more chronic health conditions was not associated with smoking status.

Receipt of a routine health examination was significantly associated with participant BMI. Mean BMI among men who had received a routine health examination was slightly higher (27.9 kg/m^2), than that of men who had not received an exam (26.2). Mean medical mistrust was not significantly associated with body mass index. Among predisposing factors, age was the only factor that was significantly associated with body mass index. Men over the age of 40 had a higher BMI than men between ages 18-29, and 30-39. Level of education, marital status, and recruitment site, were not associated with participant BMI. However, both having health insurance and a usual source of care were significantly associated with BMI. Men with health

insurance and men with a regular source of care had slightly higher body mass indices than men without insurance or a regular source of care. However the body mass index difference between men with and without insurance was minimal. There was no significant association between body mass index and having one or more chronic health conditions.

Adjusted Associations between Primary Predictors and Cancer Related Risk Factors

After adjusting for all covariates there remained no association between the primary predictors and current smoking status (Table 3). Having received a routine health examination in the last year was not associated with smoking status (OR= 1.24, 95% CI 0.71-2.18). Further, mean medical mistrust was not significantly associated smoking status (OR=1.68, 95% CI 0.78-3.66).

Among predisposing, enabling and need factors there were some significant associations with current smoking status (Table 3). There was no significant association between age and smoking status. However, compared to the referent group (men with less than or equal to a high school education), men with a college or professional degree were significantly less likely to be current smokers (OR=0.34, 95% CI 0.16-0.69). There was no association between having some college education and current smoking status. In addition, men who were married were less likely to be current smokers than unmarried men (OR=0.38, 95% CI 0.18-0.79). Next, there was no association between recruitment at a barbershop and smoking status, compared to recruitment at an academic institution or event (95% CI 0.87-2.72). Lastly, there were no statistically significant associations between current smoking status and any of the examined enabling or need factors (having health insurance, a usual source of care or one or more chronic health conditions, Table 3).

Hosmer-Lemeshow goodness of fit tests indicated that our model adequately fit the data (p-values ranged from 0.12-0.85). Cox and Snell R^2 and Nagelkerke R^2 indicate that our fully adjusted model explained a fair percentage of the variance for smoking status (Cox and Snell 9.9-12.3%, Nagelkerke 14.3-19.9%).

Men who received a routine health examination within the last year had a higher body mass index, [1.38 units (kg/m^2) higher] than men who did not receive an exam (B=1.38, 95% CI 0.16-2.59) (Table 5). However, there was no significant association between level of medical mistrust and body mass index after adjusting for covariates.

In regards to predisposing factors (Table 5), men over the age of 40 had a body mass index, 3.05 units (kg/m^2) higher than men between the ages of 18 and 29 (referent group)(B=3.05, 95% CI 1.68-4.42). There was no association between the age 30-39 category and body mass index. Next, men with some college showed no association with body mass index, though participants with a college or professional degree had a body mass index 1.76 units (kg/m^2) higher than men with less than or equal to a high school education (B=1.76, 95% CI 0.35-3.17). Married men also had a higher BMI [1.66 units (kg/m^2)] than unmarried men (B=1.66, 95% CI 0.37-2.96). Compared to recruitment at an academic institution, being recruited at a barbershop was not associated with body mass index.

Among enabling and need factors (Table 5), having health insurance was associated with a lower BMI, however this association was not seen with having a usual source of care. Men with health insurance had a lower BMI [1.29 units (kg/m^2)] than men without health insurance (B= -1.29, 95% CI -2.54 – 1.29). Yet, men with a usual source of care did not have either a higher or lower body mass index, compared to men without a usual source of care (Table 4). Lastly, there

was no statistically significant association between having one or more chronic health condition(s) and body mass index.

Effect Modification

After adjusting for all covariates including the interaction term, a non-significant relationship between the primary predictors and smoking status was observed (Table 4). In addition, the relationship between receipt of the routine health examination and body mass index was not moderated by level of medical mistrust (p=0.604) (Table 6).

R^2 and adjusted R^{2}'s indicate that our fully adjusted model explained between 15-16.9%, and 12.3-14.3% of the variance for body mass index, respectively.

Discussion

The goal of this study was to examine the relationship between receipt of a routine health examination, medical mistrust and two cancer related risk factors (body mass index and smoking status) among a community-based sample of African American men. We hypothesized that receipt a routine health examination within the last year is associated with being a non-smoker and having a lower body mass index. Further, we proposed that medical mistrust would moderate this relationship, and that men with higher levels of mistrust would have a less favorable cancer related risk factor profile and therefore more likely to be current smokers and have higher body mass indices.

We found that after controlling for socio-demographics, health care access and presence of chronic health conditions, there was a statistically significant association between higher body mass index and receipt of the routine health examination within the last year. This finding was contrary to our hypothesis that mean body mass index among men who received the routine

health examination would be lower than that of men who did not receive an examination. Although this finding was statistically significant, the difference (1.77 kg/m^2) may not be clinically significant. Further, we found no association between the routine health examination and smoking status. In addition, medical mistrust did not moderate the relationship between the routine health examination and the cancer related risk factors. Level of medical mistrust did not significantly affect the strength or direction of the relationship between receiving an examination and either smoking status or body mass index. Lastly, there were no statistically significant independent relationships between mean medical mistrust and either smoking status or body mass index.

Previous analyses indicate that delay in receipt of a routine health examination is associated with higher levels of medical mistrust (10). However, we did not find evidence to suggest that the relationship between receipt of a routine health examination within the last year and either BMI or smoking status differs by level of medical mistrust. This is consistent with previous studies examining medical mistrust and specific health outcomes (19).

Routine Health Examination and Smoking

The absence of a relationship between receiving a routine health examination and being a current smoker may be explained by several factors. Lack of smoking cessation counseling performed during the exam, ineffectiveness of counseling or the absence of a true difference between non-smokers and current smokers may account for this finding. Evidence supports the effectiveness of smoking cessation counseling during a periodic health examination (20). However, our study did not examine individual components of the health examination, such as provision of smoking cessation counseling. Independently evaluating smoking cessation

counseling, performed during the routine health examination may better estimate the relationship with current smoking status.

Routine Health Examination and BMI

As previously stated, a contradictory inverse relationship was seen between BMI and the routine health examination. Men who received the routine health examination had higher body mass indices than those who did not receive an examination in the last year. This may suggest that overweight men may be more likely to seek and receive care compared to men who are of normal weight or slightly overweight. Although we controlled for the presence of chronic health conditions, theoretically accounting for co-morbidities that would require more contact with the health care system, this may not have fully captured more severe or persistent health conditions. Lastly, the BMI difference between men who did and did not receive a routine check up, though statistically significant, may not be clinically significant.

Medical Mistrust, Smoking and BMI

The absence of a relationship between medical mistrust, current smoking status and body mass index may in fact underscore the complexities of medical mistrust and the patient-physician relationship. Our medical mistrust scale measured mistrust in healthcare organizations and not with individual providers. Mistrust among African American men may vary between health organizations and individual health care providers. The latter relationship may have a greater association with health behaviors, than that with medical institutions; however, we did not measure mistrust in individual health care providers.

Further, although mistrust towards the medical establishment is associated with scheduling and receipt of an examination, this measure may fail to capture trends for high-risk health behaviors, and subsequent cancer related risk factors. Men with high levels of mistrust may indeed delay

scheduling and receipt of preventive health care but continue to engage in lower risk health behaviors. The interaction between medical mistrust and certain health behaviors may be distinct, based on the behavior (21). Therefore, mistrust though associated with seeking and receiving health services, is not a strong contributor to other health decisions (smoking or maintaining a health body weight).

Although there are no studies examining either the relationship between the routine health examination, smoking status and BMI, or medical mistrust, smoking status and BMI, there are studies evaluating the effectiveness of the RHE (11) and the role of medical mistrust and certain health outcomes (19). Our findings add to the current body of literature and offer further insight into preventive health care services and medical mistrust. In addition, studies examining the role of both preventive services and medical mistrust as they pertain to men's health are lacking. This study suggests that men with a higher body mass index are more likely to receive a routine health examination within the last year. Furthermore, it proposes that the routine health examination may not be an influential predictor of smoking status. Also, although a high level of medical mistrust is associated with preventive service delays, these delays may not translate to specific health risk factors, including current smoking status and body mass index.

Limitations

This study has several limitations. As this is a cross-sectional analysis, we are unable to establish causation and only able to report associations. Also, the use of self-report data introduces possible recall and measurement bias. The calculation of body mass index was based upon a crude estimate of participant's self-reported height and weight, and limits the validity of this measurement. In addition, although a statistical association was found between the routine health examination and body mass index, this may not be clinically significant. The minimal difference in body mass index ($1.77 kg/m^2$) between men who received and did not

receive the routine health examination, may have limited clinical implications. Next, only a fair amount of the variance (10-20%) was explained in our models. The absence of other variables (e.g. received weight and/or smoking cessation counseling, level of physical activity, and nutrition) may have contributed to this. Lastly, given the small sample size and relatively high proportion of men who had received a routine health examination (>70%) in the last year, this study population may not be representative of the general African American male population.

Conclusions

Our findings may suggest that: (1) receipt of the routine health examination in and of itself has little effect on certain health behaviors or health risk factors (2) the assumption that certain components of the health examination are performed during the examination (risk assessment and/or behavioral counseling) may be incorrect (3) components of the examination likely to address smoking status and BMI, may be of varying quality, duration or effectiveness (4) there are limitations to using the routine health examination as a proxy for risk assessment and/or behavioral counseling, and finally that (5) medical mistrust is a poor contributor in the relationship between receipt of preventive services and cancer related risk factors. Medical mistrust in health organizations may fail to capture the complexities of both the patient-physician relationship and intention to change.

Future Implications

In order to more accurately answer the questions addressed in this analysis, as well as those in future studies on African American men's health, additional research on preventive health service use, and health outcomes among African American men is needed. Studies exploring the complexities of medical mistrust and how it relates to behavior change and ultimately health outcomes are also needed. Lastly, further investigation of preventive care among African

American men may elucidate effective components of the routine examination including health messages and care models for prevention.

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Table 1. Study Sample Characteristics

	Total (N=402) **% (n) or Mean (+/- SD range for all five datasets)**
Predisposing Factors	
Age (years)	30.7 (+/- 12.2-12.3)
Age (categories) 18-29 30-39 >40	 57.9(233) 18.9(76) 23.1(93)
Education level < High School Some College College graduate or professional degree	 26.1(105) 45.3(182) 28.6(115)
Married No Yes	 73.4(295) 26.6(107)
Recruitment Site Educational Institution/Academic Event Barbershop	 34.1(137) 65.9(265)
Enabling Factors	
Has health insurance? No Yes	 37.8(152) 62.2(250)
Has a usual source of care? No Yes	 45.0(181) 54.9(221)
Need Factors	
Has one or more chronic health conditions? No Yes	 29.8(120) 70.2(282)
Primary Predictors	
Received a Routine Health Examination within the last year No Yes	 26.8(108) 73.1(294)
Medical Mistrust	2.54 (+/-0.35-0.36)
Outcome Variables	
Current Smoker No Yes	 73.4(295) 26.6(107)
Body Mass Index	27.5 (+/- 4.9-5.1)

Table 2. Unadjusted Bivariate Associations Between Study Sample Characteristics and Outcome Variables, BMI and Smoking Status

	Body Mass Index		Current Smoker %(n)		
	Mean (SD range)	P Value or P Value Range*	No	Yes	P Value or P Value Range*
Predisposing Factors					
Age 18-29 30-39 >40	26.2 (+/- 4.3-4.5) 28.2(+/- 4.6-5.0) 30.1 (+/- 5.4-5.6)	p<0.001	68.2(159) 76.3(58.4) 82.7(77)	31.3(73.4) 23.6 (18) 17.2 (16)	p=0.013-0.044*
Education < High School Some College College graduate or professional degree	26.9 (+/- 4.4-4.9) 27.2 (+/- 5.1-5.2) 28.5 (+/- 4.8-5.1)	0.019-0.073*	60.9(64) 72.5(132) 86.0(99)	39.0(41) 27.4(50) 13.9(16)	<0.0001
Married No Yes	26.8 (+/- 4.6- 4.8) 29.4 (+/- 5.4-5.5)	0.08-0.30*	68.1 (201) 87.9(94)	31.8 (94) 12.1(13)	<0.001
Recruitment Site Educational Institution/Academic Event Barbershop	27.1 (+/- 5.3-5.4) 27.7(+/- 4.7-4.9)	0.338	75.2(103) 72.1(191)	24.8(34) 27.9(74)	0.409-0.557*
Enabling Factors					
Has health insurance No Yes	27.4 (4.3-4.5) 27.6 (5.3-5.5)	0.007-0.045*	62.5(95) 80.0(200)	37.5(57) 20.0(50)	<0.001-0.001*
Has a usual source of care No Yes	26.9 (+/- 4.2-4.6) 28.0 (+/- 5.4-5.5)	0.003-0.027*	67.9(123) 77.8(172)	32.0(58) 22.17(49)	0.01-0.05*
Need Factors					
Has one or more chronic health conditions No Yes	26.9 (+/- 4.9- 5.0) 27.7 (+/- 4.9-5.1)	0.199-0.700*	66.6(80) 76.2(215)	33.3(40) 23.7(67)	0.031-0.067*
Outcome Variables					
Received a Routine Health Examination in the last year No Yes	26.2 (+/- 3.9-4.4) 27.9 (+/-5.2-5.3)	0.002-0.004*	70.3 (76) 74.4 (219)	29.6(32) 25.8(76)	0.263-0.519*
Medical Mistrust	B=1.13	0.154	OR=0.97		0.298

Table 3. The Association Between Study Characteristics and Current Smoking Status: Multiple Logistic Regression Analysis (N=402)

	Model 1 (Fully Adjusted)	
	AOR (95% CI)	P Value
Predisposing Factors		
Age (ref. 18-29) 30-39 >40	 0.835 (0.414 - 1.684) 0.654 (0.321 - 1.333)	 0.614 0.242
Education (ref. < High School) Some College College Graduate/Professional Degree	 0.651 (0.357 - 1.189) 0.336 (0.163 - 0.692)	 0.161 0.003
Marital Status (ref. unmarried)	0.381 (0.184 - 0.788)	0.009
Recruitment Site (ref. Academic Institutions/Events) Barbershops	 1.539 (0.871 - 2.720)	 0.138
Enabling Factors		
Has Health Insurance (ref., no insurance)	0.625 (0.344 - 1.135)	0.121
Has a Usual Source of Care (ref., no usual source of care)	0.876 (0.503 - 1.525)	0.639
Need Factors		
Has one ore more Chronic Health Conditions (ref. No Chronic Health Condition)	0.912 (0.522 - 1.594)	0.747
Primary Predictors		
Medical Mistrust	1.687 (0.778 - 3.656)	0.185
Received a Routine Health Examination (ref., no routine health examination within the last year)	1.241(0.707 - 2.18)	0.452

Table 4. Interaction Between Primary Predictors and Current Smoking Status: Multiple Logistic Regression Analysis (N=402)

	Model 2 (Fully Adjusted)	
	AOR (95% CI)	P Value
Primary Predictors		
Medical Mistrust	2.32 (0.671-8.030)	0.183
Received a Routine Health Examination (ref., no routine health examination within the last year)	4.76 (0.066-344.9)	0.474
Interaction Term (Receipt of a Routine Health Examination*Medical Mistrust)	0.597(0.418-1.719)	0.535

Table 5. The Association Between Study Characteristics and Body Mass Index: Multivariate Linear Regression Analysis (N=402)

	Model 3 (Fully Adjusted)	
	B (95% CI)	P Value
Predisposing Factors		
Age (ref. 18-29) 30-39 >40	 1.295 (-0.085 – 2.676) 3.049 (1.678 - 4.420)	 0.066 <0.001
Education (ref. < High School) Some College College Graduate/Professional Degree	 1.007 (-0.262 - 2.276) 1.761 (0.351 - 3.172)	 0.119 0.015
Marital Status (ref. unmarried) Married	 1.668 (0.370 - 2.965)	 0.012
Recruitment Site (ref. Academic Institutions/Events) Barbershops	 0.023 (-1.060 - 1.160)	 0.967
Enabling Factors		
Has Health Insurance (ref., no insurance)	-1.292 (-2.538 - -0.046)	0.042
Has a Usual Source of Care (ref., no usual source of care	0.206 (-0.875 - 1.288)	0.708
Need Factors		
Has one ore more Chronic Health Conditions (ref. No Chronic Health Condition)	-0.539 (-1.726 - 0.647)	0.372
Primary Predictors		
Medical Mistrust	1.309 (-0.258 - 2.875)	0.100
Received a Routine Health Examination (ref., no routine health examination within the last year)	1.385 (0.185 - 2.586)	0.024

Table 6. Interaction Between Primary Predictors and Body Mass Index: Multiple Linear Regression Analysis (N=402)

	Model 4 (Fully Adjusted)	
	B (95% CI)	P Value
Primary Predictors		
Medical Mistrust	0.697(-2.204-3.598)	0.630
Received a Routine Health Examination (ref., no routine health examination within the last year)	-0.952(-9.830-7.925)	0.831
Interaction Term (Receipt of a Routine Health Examination*Medical Mistrust)	0.902(-2.578-4.383)	0.60

Colorectal Cancer Screening Adherence Among non-Hispanic Black Men:

A Systematic Review

Introduction

Despite recent declines in incidence and mortality rates, colorectal cancer remains the third leading cancer among men in the United States (U.S.)(1). Rates of new cases vary by race, with 51.6 per 100,000 new cases of colorectal cancer among all men, 50.2 per 100,000 among non-Hispanic white men and the highest rate—63.5 per 100,000—among non-Hispanic Black (Black) men (1). The mortality rate for colorectal cancer among Black men also exceeded the rate among both men and women within all race/ethnicity categories (1).

In 2012, over 26,000 deaths from colorectal cancer are estimated to occur (2). Mortality rates among Black men are likely to continue to remain disproportionately high.

Screening for colorectal cancer reduces mortality by identification and removal of pre-cancerous adenomatous polyps (3). According to National Health Interview Survey data, in 2010 58.6% of adults in the U.S. received colorectal cancer screening (4). Compared to non-Hispanic White men and women and non-Hispanic Black women, Black men have the lowest rates of colorectal cancer screening (5). In 2005, over 55% of Black adults reported never having colorectal cancer screening (6). Behavioral Risk Factor Surveillance data show slightly fewer (63.7%) Blacks report having ever had a sigmoidoscopy or colonoscopy compared to non-Hispanic White adults (66.8%) (7). Conversely, more Black adults (19.9%) reported having a stool blood test in the previous two years than non-Hispanic White adults (17.4%) (8). These national data underscore cancer screening disparities. Compared to Whites, Black adults report fewer endoscopies, and conversely, more stool blood tests.

There is evidence that colorectal cancer screening among Blacks, particularly after controlling for confounders, is comparable to that—if not higher than—screening among White adults (9-13).

Screening rates also have been shown to vary within certain subpopulations. Colorectal cancer screening among Black male veterans exceeds that of White male veterans (14). Moreover, meta-analyses of self-reporting accuracy have shown that self-reporting of colorectal cancer screening often overestimates true screening when compared to objective data. Racial/ethnic minorities are more likely to over-report cancer screening than Whites. One meta-analysis demonstrated that nearly half of self-reported positive colorectal cancer screening histories were in fact negative and that racial/ethnic disparities are likely larger than reported in national datasets (15).

Given these conflicting data, this systematic review aims to evaluate the current literature examining colorectal cancer screening adherence among Black men. In addition to reviewing reported colorectal cancer screening adherence rates among non-Hispanic Black men, this review will also explore the types of populations studied, and how adherence has been measured. This study will specifically review how established guidelines (i.e. American College of Gastroenterology, American Cancer Society, United States Preventive Services Task Force) are used to measure adherence, whether studies differentiate between screening tests and non-screening tests (i.e. follow-up or surveillance) and whether subjective, self report data or objective data (medical records, claims data) are used.

For our review, we aim to answer the following three key questions:

(1) Key Question 1: What are the reported colorectal cancer adherence rates among African American men?

(2) Key Question- 2: What populations and/or subpopulations of non-Hispanic Black men have been studied?

(3) Key Question 3: How is adherence/uptake measured? By self-report, claims-based, guideline consistent screening, ever screened or ever received a test?

Methods

PubMed (Medline), EMBASE, and CINAHL databases were used to search for all relevant articles published within the last 10 years. Search terms used, according to database, included:

(1) PubMed- "Colorectal Cancer AND Screening AND adherence AND guideline adherence (MeSH) AND African Americans (MeSH)

(2) EMBASE- "Colorectal Cancer/exp/mj AND Screening/exp AND practice guideline/exp AND African American/exp"

(3) CINAHL- "Colorectal Cancer AND Screening AND Adherence AND African American"

Free text and MeSH search terms were used in the PubMed search, while search terms were "exploded (exp)" and used as a "major topic (mj)" in the EMBASE search. Search limitations based on sex, study type and date were not used, as this significantly limited the number of possibly relevant studies for inclusion in preliminary searches.

One reviewer performed the title search, reviewed abstracts, full texts and abstracted all data. To be considered for inclusion in this review studies had to (1) evaluate colorectal cancer screening adherence and (2) include data on Black men. Studies were excluded if they (1) did not evaluate colorectal cancer screening adherence (2) did not include data on Black men (3) were randomized controlled trials of the effectiveness of implementing a screening intervention (4) were qualitative (5) were review or guideline articles (6) only examined patient education or physician practice only (7) only evaluated predictors of adherence (i.e. attitudes, perceptions, barriers, preferences) or (8) examined non-adherence only. A brief summary of each article, including a critical analysis, determination of overall quality and relevance to the three key questions are included for each study. Quality of each study was determined based upon measurement of potential selection, measurement, and recall bias, as well as level of internal and external validity.

Results

The initial title search from all three databases yielded a total of 125 titles (Figure 1), after which 34 were eligible for abstract review and subsequently 7 full texts were reviewed. This report reviews seven original studies published in the United States from 2003 to 2012.

Leone et al. 2012

Leone et al.(16) performed a cross-sectional analysis of cancer screening, weight and gender among Black church members in two geographically diverse locations. This study examined the cancer screening patterns by weight and gender among 955 urban Black church members in Flint, Michigan, Wake, Durham, and Guilford counties in North Carolina. Data was collected from baseline survey data, obtained during a colorectal cancer prevention trial (ACTS of Wellness Study).

The aims of this study were four-fold, to: 1) examine the differences in colorectal cancer (CRC) screening rates among Black men and women in four weight classes (normal weight, overweight, obese I, and obese II), (2) determine whether the negative relationship between CRC screening and weight, previously observed in Black church members persists since colonoscopy became a preferred method (3) investigate whether results differed based on the definition of CRC screening used, and (4) examine patterns of breast, cervical and prostate cancer screening based on weight.

Churches were eligible for inclusion if they had at least 50 church members who were age 50 or older, and had a coordinator willing to recruit members, while individuals were included if they were (1) Black (2) age 50 or older, and (3) participated in the baseline survey given prior to randomization in the CRC prevention trial.

The primary colorectal cancer adherence measures were based upon the 2008 American Cancer Society Joint Guidelines for average risk persons (i.e. having a stool blood test in the past year, colonoscopy in the past 10 years, flexible sigmoidoscopy in the past 5 years, double contrast barium enema in the past 5 years or virtual colonoscopy in the past 5 years). They also further defined "Up-to-Date" CRC screening based on risk status. Whereby participants not reporting a history of colonic polyps were classified as "Up-to-Date screening," if they met the above screening guidelines, and those with a history of polyps were "Up-to-Date Surveillance", if they had both a past history of polyps and reported having a follow-up colonoscopy during the recommended time-frame. Screening behaviors were measured using a reportedly valid tool.

Overall, the authors found that 74.5% of all (male and female) participants reported having any CRC screening test, and among 284 male participants, 72.9% reported having any CRC screening test, 64.4% had a colonoscopy only, and 12.7% had a stool test only. Moreover, 60.7% of Black males who did not previously report having polyps were up-to-date on CRC screening. The authors also report the proportion of men who received polyp surveillance (68.2%), those who received screening or surveillance (63.0%). There was also a significant association between weight group and CRC screening. Men with a BMI between 29.95 and 34.94 were more likely to be up-to-date with CRC screening than normal weight men. No significant differences based on weight were found among women.

Analysis

Although this study had several aims, including examining adherence rates among Blacks, all research questions were clear, and well defined. The sample population was fairly narrow, and specific, including only church members in four distinct locations, who participated in the previously administered CRC prevention trial. In addition to excluding non-church members in these same counties, church members not participating in the prevention trial (and baseline

survey) were understandably not included, however systematic differences between these two groups may have introduced bias (i.e. study participants are more likely to seek/obtain CRC screening than non-participants in the church). Nonetheless, the authors clearly stated how adherence was measured, and created multiple measures to clarify those at average risk receiving "any screen," those at average risk receiving guideline consistent screening (classified as "up-to-date screening") and those with a history of polyps receiving follow-up or surveillance (classified as "up-to-date surveillance"). However, the authors did not verify test purpose (i.e diagnostic testing versus true screening).

The method used to measure screening behavior was reported as being a "valid" measure, though further detail is not provided about this tool. All statistical analyses appeared appropriate, and although the overall sample size was large (955); the sample was largely female, with only 284 male participants. The potential for selection bias within each respective church was fair, as the study population could have been quite different from the sample population. Those who participated in the trial (and survey) may have been different than those choosing not to participate. Church members participating in the study, and survey may be more motivated, and proactive about their health. However, the inclusion criteria for individuals were broad and did not appear to exclude church members who had indeed participated in the survey.

It appears that all participants were measured equally, completing a 100-item self-administered questionnaire, eliminating the potential of interviewer bias, if face-to-face interviewing were implemented. However, given that objective data (medical records, claims data), confirming test adherence was not obtained, the potential for recall bias was high, and therefore a significant limitation of this study.

Furthermore, the potential for measurement bias of the outcome (adherence to CRC screening) was fair. Though, authors thoroughly evaluated average risk screening versus surveillance for polyps, they did not measure those receiving a stool test or endoscopy for diagnostic purposes. Participants receiving any of the CRC tests for reasons other than screening or polyp surveillance may have been falsely included in the “any screen” or “up-to-date screening” group. This differential measurement bias has the potential to overestimate true screening adherence rates and falsely inflate their results.

In regards to the multivariate logistic findings, the authors did consider and control for a variety of socio-demographic and behavioral covariates, which lends strength to the results, however a complete review of these findings are beyond the scope of this review.

The magnitude of their CRC adherence rates was surprising, given the high rate of receiving either any CRC test (72.9%) or up-to-date guideline consistent CRC screening (60.7%), among male participants. These rates are higher than the national average and may also be indicative of the characteristics of the study population. Over 97% of all participants (male and female) reported having health insurance, while 62% reported earning between $20,000 to $99,999 annually. These results, as well as the very narrow and specific study population limits the overall generalizability of their findings, while the fair potential for selection, recall, and differential measurement bias limits the studies internal validity. However, overall this study was of good quality.

Summary of Leone et al.

Overall, in regards to the three key questions posed in this review, this study provided very clear data on colorectal cancer screening rates among Black males (as well as females), however the

sample, and study population were quite specific, and likely not representative of the general population of Black males. The authors did examine adherence to guideline consistent screening (2008 ACS Joint Guidelines), and make good attempts to differentiate true screening, from follow-up or surveillance among higher risk individuals, though they did not consider the potential for testing for diagnostic purposes. Also, as in previous studies, they relied on self-report data, and did not corroborate reported screening with more objective data (medical records or claims data).

Palmer et al. 2011

Palmer et al. (17) also performed a cross-sectional analysis of colorectal cancer screening adherence among a very discrete population between April and July of 2008. This study aimed to identify factors that influenced adherence to CRC screening among Blacks in Maryland (as well as identifying adherence rates). A total of 504 Maryland residents, selected by random digit dialing, who self-identified as Black, 50-75 years of age, and reported never having any type of cancer were included in their analysis.

Participants were interviewed via telephone, with a pilot tested, 80-item survey, though the survey was not reported to be an established valid or reliable instrument. Their main adherence measures were ever receiving a CRC screening test, defined as (1) having an FOBT in the past year (2) barium enema in the past 5 years, (3) flexible sigmoidoscopy in the past 5 years or (4) colonoscopy in the past 10 years (based on American Cancer Society 2008 guideline updates).

The authors found that 77.4% of the total study population was adherent to CRC screening, and 75.8% of Black males were adherent to screening. Though this was slighter lower than adherence rates among Black women (79%), this difference was not statistically significant. Of note, in regards to influencing factors, the study also found that care giving status, physician

recommendation, perceived risk and health care coverage were significant predictors of adherence to screening. Caregivers were less likely to be adherent, while those who received a physician recommendation, perceived themselves to be high risk, or had insurance were more likely to be adherent.

Analysis

This study developed both clear and well-defined research questions, focusing on both identifying adherence rates, as well as other possible influencing factors. The sample population, as with Leone et al., was relatively narrow, as participants were only residents of Maryland and had to have a listed landline telephone number in order to be eligible for inclusion. This need for telephone access is of course understandable as the survey was delivered via phone, however this may have excluded individuals of lower SES. Moreover, the exclusion of residents with a history of any cancer, may also have excluded a significant number of potential participants. Excluding those with a history of colorectal cancer only would have been a more accurate exclusion criterion. Unlike Leone et al., there were an equal number of both male and female participants, with a total of 252 Black males. Also, 87% of participants reported having health insurance, which may not be representative of the entire population in Maryland.

The measures of colorectal cancer screening, though guideline consistent (ACS, USPSTF), failed to capture whether tests were truly for screening purposes or for diagnosis or surveillance. The survey instrument, though previously piloted tested, was not reportedly valid or reliable. Moreover, measures were self-reported and not objective. Statistical analyses were appropriate for their design and study question, and the sample size, though moderate, was adequate given the scope of the study. The magnitude of their results, as with Leone et al., was surprising, and may be representative of the population surveyed (>86% insured), but also may shed light on access to care and preventive services among this population. The authors suggest that

aggressive outreach efforts, conducted by the State of Maryland between 2004 and 2008 may be a contributing factor to such large adherence rates.

In considering the internal validity of this study, the potential for selection bias was moderate, given that individuals without a telephone or listed phone number, possibly of lower socioeconomic status, were excluded as well as well as those with a prior history of any cancer. The low survey completion rate (57.5%), may also have selected for a specific population. It is unknown whether those who did not complete the survey were different from study participants, and if this could have biased the final results.

This may have falsely over-estimated true screening, if those receiving diagnostic or surveillance testing reported screening. Additionally, given that telephone interviewers were used, instead of a self-administered exam, this could have introduced added bias, if interviewers were more (or less) likely to document adequate screening among unscreened or those receiving follow-up/surveillance. As with Leone et al., this study relied on self-report history and did not use medical records or claims data, thus potential for recall bias (and over-reporting) is significant. Also, for their multivariate analyses, authors did measure and control for all reasonable covariates in their models, though a complete review of these findings are beyond the scope of this review. Their final results may be generalizable to other Blacks in Maryland, yet the use of random digit telephone dialing, exclusion of those with a history of cancer and high rates of insurance use, potentially limits its external validity. Results cannot be generalized to other populations of Black males in other states. Overall, this study was of fair quality.

Summary of Palmer et al.

In sum, this very focused cross-sectional survey analysis provides somewhat variable quality data on adherence to guideline consistent colorectal cancer screening among Black male

residents in Maryland. The authors failed to account for true screening versus testing for diagnosis or surveillance, thus rates may be overestimated. In addition, the use of self-report data, instead of medical records or claims data poses threats to internal validity. The narrow study population and sample population, and surprisingly high rates of having health insurance also limit generalizability.

Shavers et al. 2010

Shavers et al. (18) performed a cross-sectional analysis of racial/ethnic patterns of colorectal cancer screening uptake patterns on National Health Interview Survey (NHIS) data in 2003, 2008 (Sample Adult Cores) and 2000, 2005 (National Cancer Institute sponsored cancer control supplement). Study aims were to identify (1) rates of initiation of colorectal exams among eligible Blacks, Hispanics and non-Hispanic Whites (2) racial/ethnic differences in utilization of specific screening guidelines (3) racial/ethnic adherence to colorectal screening guidelines; and (4) racial/ethnic variation in the self-reported rate of uptake of colonoscopy. NHIS surveys were conducted in person, among 85,000 (Sample Adult Cores) and 39,000 (NCI Cancer Control Supplement) civilian, non-institutionalized individualized. A final sample of 46,145 participants is included in this study. Persons under the age of 50, not Black, Hispanic, or non-Hispanic White, with a history of colorectal cancer or with unknown data were excluded.

Adherence measures were defined based on having a colorectal exam for screening purposes only (excluding follow up of abnormal tests, previous symptoms or other reasons). Participants with a history of a previous abnormal FOBT were not considered in the screening group. Also, persons having a test for unknown reasons or within unclear time frames were coded as "unknown for colorectal cancer screening," and excluded from multivariate analysis of guideline consistent screening. Further, guideline consistent examinations were defined based upon American Cancer Society Joint Guidelines(19): (1) colonoscopy in the last 10 years, (2)

sigmoidoscopy in the last 5 years, other/unknown endoscopy in the last 5 years, or (3) home FOBT in the last year.

The authors found that in 2008, 30.6% of non-Hispanic Blacks (NHB) had a guideline consistent colonoscopy, compared to 33.3% in non-Hispanic Whites (NHW) and 20% among Hispanics. Rates for home FOBT, sigmoidoscopy and other/unknown endoscopy were 7.2%, 1.0% and 0.7% respectively for NHB in 2008. Specific rates or percentages among NHB males are not provided. Multivariate analyses of data revealed that NHB were less likely than NHW to ever receive a colorectal exam for any reason (AOR=0.85, CI 0.78-0.92). When analyzed by race and gender, NHB males were more likely than NHB females to receive a screening sigmoidoscopy or other endoscopy in the past 5 years. There were no significant differences between NHB males and females in adherence to colonoscopy or home FOBT, and comparisons were not made between races/ethnicities (i.e. comparisons are made within each race/ethnicity category).

In terms of receipt of a guideline consistent examination, there were no significant differences between NHB males and females. However, NHB (males and females) over age 65, with an income of 75,000 or above and with more than a high school education were more likely to receive a guideline consistent examination than persons under age 65, with annual incomes less than $75,000 and with less than a high school education.

Analysis

Shavers et al. developed clear and well-defined research questions, with particular attention to quantifying receipt of guideline consistent screening estimates, among three racial/ethnic groups. Given the use of NHIS data, the sample population was nationally representative and diverse, with few exclusion criteria. Individuals with data that could not be ascertained (n=109)

were excluded, however it is not made clear how data were “ascertained” for all other participants, as all data were by self-report. The loss of individuals with unverified data could have excluded individuals who had received adequate screening and underestimated adherence rates.

The adherence measures of receipt of a guideline consistent examination were clear, thorough, and evidence based, though it is unclear whether survey questions were valid and reliable. As with the previous two studies, all measures were obtained through self-report only. Statistical analyses were appropriate, and all reasonable attempts to exclude non-screening colorectal exams in adjusted analyses were made. The large sample size strengthens the findings in the analyses as well.

However, the greatest limitation of this study (given the aim of this review) is that the authors do not provide specific rates (percentages or proportions) of colorectal cancer adherence for Black males. Adjusted odds ratios for screening among Black males are provided, however these data are stratified by race/ethnicity, therefore one cannot make comparisons between Black males, and males and females of other races/ethnicities. Results did show that overall screening rates among Blacks were lower than those among non-Hispanic Whites, and certain groups of Black men were more likely to receive screening than other Black men.

In regards to internal validity, the potential for selection bias was fairly low. The authors do not provide detail on how participants are selected for the NHIS, however exclusion criteria were reasonable and did not perceivably exclude other potentially relevant groups. Sample characteristics among and between racial/ethnic groups did not appear to significantly affect the results, though the sample was mostly White, female, married, with an income less than 35,000 a year.

As with Palmer et al., the potential for differential measurement bias of adherence was low, but could be introduced based upon differential measurement of adherence among tested (yet not screened) participants versus truly screened individuals. Although it is not made clear if measures were taken to ensure consistency between all interviews, the authors clearly describe how true screening was verified. The authors controlled for a variety of potential confounders in adjusted models, which adds strength to the validity of these analyses. However, as seen in the two previous studies, all data were self-reported, and not confirmed with more objective data which again introduces potential for recall bias, particularly for Blacks (15). Since data were obtained from NHIS survey data, the study sample is reported as nationally representative, and therefore relatively generalizable to other populations of these racial/ethnic groups in the US.

Overall, regarding the aims and research questions of this study, both internal and external validity were good and the quality was good. However given the goal of this review, it did not provide specific adherence rates of CRC screening among Black males, particularly in comparison to other groups.

Summary of Shavers et al.

In regards to the three key questions of this review, this cross-sectional study failed to address specific adherence rates among Black males. However their results do provide general, nationally representative adherence data comparing odds of adherence between Black males and females. Lastly, as with the previous studies reviewed, this analysis both uses ACS Joint Colorectal Cancer screening guidelines and self-reported screening data, without other objective data. Overall, this study was of good quality.

Hood et al. 2010

Hood et al. (20) investigated self-reported patterns of colorectal cancer screening among Blacks using the National Cancer Institute questionnaire. Their goals were to identify (1) self-reported screening, screening method, factors associated with screening and (2) response pattern to items that may affect estimates of screening adherence using items from the NCI CRC Screening questionnaire. This cross-sectional analysis obtained data from a larger study (Elimika Project, September 2006 to May 2008), and included a final sample of 439 Blacks, between the ages of 45 and 75, born in the U.S and residing in urban and suburban communities in St. Louis. Exclusion criteria included previous diagnosis of CRC and difficulty with reading and/or comprehension. Survey data was collected via mailed, written questionnaires.

Colorectal cancer adherence measures were by self-report only and included (1) ever being screened for colorectal cancer and (2) ever receiving a FOBT, sigmoidoscopy, or colonoscopy. Participants were given multiple time ranges as options for each screening exam. American Cancer Society (ACS) and United States Preventive Services Task Force (USPSTF) colorectal cancer screening guidelines were used to define guideline consistent adherence. Participants also reported month and year of most recent test (if known). However, reason for the test was not examined (i.e. screening, diagnosis, surveillance).

Approximate adherence rates are provided in the manuscript text, yet no specific data tables are provided for either adherence or the other main study questions. The authors report that 58.9% of male participants were adherent to colorectal cancer screening guidelines (compared to 67.5% of Black females). Colonoscopy and FOBT screening rates among males were 49% and 38%, respectively. Rates of screening colonoscopy were 20% higher among women than men. Screening rates of sigmoidoscopy are estimated at approximately 25%, and were reportedly

equal between men and women, though more specific data regarding this point estimate is not provided.

Analysis

Though a priori research questions were clear and well defined, this study failed to provide clear, and valid colorectal cancer adherence rates among their study population. Measures of adherence were consistent with guidelines, and it is reported that survey questions were both valid and reliable, particularly as the study used the NCI questionnaire, however the failure to determine the purpose for test receipt, did not clarify rates of true screening tests versus tests performed for diagnostic or surveillance purposes.

Statistical analyses appeared reasonable, though authors do not describe controlling for potential confounders. Sample size was moderate, and adequate to find statistically significant findings. The results however, were not clearly reported, and in fact appeared vague. Some point estimates were not clearly described and the absence of data tables limited further clarification. Only study sample characteristics were clearly described in tables. The internal validity of the study was limited by both a fair amount of potential for selection bias, moderate potential for differential measurement and moderate potential for self-report (recall) bias.

Participants were initially recruited from randomly selected census blocks, as well as churches, fraternal organizations, nursing homes and health fairs. Individuals recruited from these populations may not be representative of the larger St. Louis metropolitan area. The study sample was largely of a higher socioeconomic status, with nearly half of all males earning over $40,000 annually, and over 60% having either some college or a college degree. Also, though exclusion criteria were few (history of CRC or difficulty with reading comprehension), it is not

clearly stated how many were excluded based on ineligibility or how many did not complete the survey.

Further, as attempts to accurately measure true screening versus diagnostic or surveillance testing were not made, the potential for differential measurement bias of adherence is significant, and could have overestimated true adherence rates. Lastly, as with all previous studies reviewed, the use of self-report data instead of objective data introduces a moderate amount of recall bias well. Overall, this study ranged from poor to fair quality.

Summary of Hood et al.

In regards to the three key aims of this review, Hood et al. does not provide clearly valid colorectal cancer screening rates among Black males in their study population. However this study does provide general data on uptake of guideline-consistent screening, using self-reported data, among a very specific, and narrow population of Black males and females located in urban and suburban areas in St. Louis, Missouri.

Lawsin et al. 2007

Lawsin et al. (21)performed a cross-sectional analysis of colorectal cancer screening among low-income, average risk, Black residents in East Harlem, New York between 1999 and 2001. The aims of this study were to understand fatalism and colorectal cancer screening, as well as other factors associated with CRC adherence and stage of adoption. Study participants were recruited from an ambulatory care center in an urban hospital, and were eligible if they self-identified as Black, were over age 51, accessible by telephone, spoke English, and were at average risk for CRC.

The authors measured adherence to colorectal cancer screening based on 2005 American Cancer Society guidelines; (1) flexible sigmoidoscopy in 5 years or (2) FOBT in 1 year. Among 111 total participants, 48 Black males (43%) are included in the analysis. The adherence rate for flexible sigmoidoscopy was 10.4% among Black men and 11.1% among Black women. The FOBT adherence rate among men was 31.3% and 34.9% among Black women. Adherence to screening colonoscopy was not measured, as the authors report that Medicaid and Medicare reimbursement for colonoscopy was not offered at the time of the study.

Analysis

Study aims and research questions were clear and well defined prior to analysis, and were adequately addressed. However the final study population did not include 83 (40%) participants who refused participation, such a large refusal rate, in an already small sample size significantly affects both the validity of the study and possibly generalizability. The characteristics of those who refused participation are unknown, and this loss may have adversely affected final adherence rates. Also, recruitment at an ambulatory care center in an urban hospital excludes a considerable number of individuals likely eligible for inclusion, and the exclusion of those without a residential telephone may have further limited otherwise eligible participants.

The colorectal cancer screening adherence measures, though consistent with current guidelines at the time of study conduction, did not include measures on colonoscopy and did not evaluate reason for testing (i.e. screening, follow-up, surveillance) and questionnaire items were not reported as reliable or valid. The authors report that patient's records were reviewed to identify eligibility requirements, however verification of CRC screening was not also performed. Statistical methods appeared appropriate and significant covariates were controlled for in multivariate analyses. Again, the small sample size limits the strength of their findings, and

decreases precision. The results found were eye opening, in that only one-third of male participants received FOBT screening, and about 10% received sigmoidoscopy.

The internal validity of this study is limited by a fair amount of selection bias (ambulatory clinic patients, with a residential telephone), moderate amount of measurement bias (failure to capture true screening versus surveillance or follow-up), and fair amount of recall bias (use of self-report data only). The final results are likely applicable to the larger sample population, but not likely generalizable to either the state population or other Black males. Overall this study was of fair quality.

Summary of Lawsin et al.

This study does in fact provide estimates of colorectal cancer screening among Black males, screened with either flexible sigmoidoscopy or FOBT, but not with a colonoscopy. The purpose of this analysis was to evaluate CRC screening among an average risk, low-income population in East Harlem, New York, thereby a very defined sub-population of Black men and therefore not a very generalizable population. Adherence measures were consistent with guidelines, yet did not include data colonoscopy use, given the lack of reimbursement at the time of the study, thereby greatly limiting measurement this screening method. As with all other studies reviewed thus far, only self-report data was used, despite access to patient medical records.

Ata et al. 2006

Ata et al. (9) examined both adherence patterns and correlates of tests done for colorectal cancer screening purposes in US populations. This large cross-sectional survey analysis aimed to evaluate adherence to: (1) any combination of recommended tests (2) CRC screening according to time guidelines only [time-only adherence] and (3) CRC screening done specifically for screening purposes [time-screening adherence]. Authors used data from the 2000 National

Health Interview Survey. Participants were recruited based upon probability sampling in 1900 geographically defined “primary sampling units” including all 50 states and the District of Columbia.

Persons over age 50, with no prior history of colorectal cancer were included for analysis, yielding a total of 12,498 individuals (Hispanic, non-Hispanic white, non-Hispanic black, and Other), representing a total population of 72.3 million. The authors reference the American Cancer Society guidelines for colorectal cancer screening but do not clearly describe these guidelines. Adherence to screening was measured as listed above, and verification of test purpose (screening versus non-screening), was measured by response to two of four questions. Those reporting testing due to (1) routine physical/screening test or (2) family history were considered as screened, while those reporting testing (3) because of a problem (4) follow up of an abnormal test or (5) other, were classified as non-adherent for the “time-screening adherence” variable.

Results for non-Hispanic Blacks revealed that compared to Whites, Blacks had a significantly higher proportion of endoscopic tests done for screening purposes (69% versus 60% $p<0.01$). This estimate is described as “time-only adherent,” done for screening purposes. However, when measuring time-screening adherence (i.e. testing done both within the recommended time frame and for screening purposes), rates of home FOBT, and endoscopy were higher, though not statistically significant, between NHW and NHB. The specific difference between these two measures (time-only adherent done for screening purposes versus time-screening adherence) is not clarified.

In addition, specific rates and proportions of adherence for all screening methods, stratified by race and gender are not provided. However the authors report that 27.1% of NHB males were

time-screening adherent, while 19.6 NHB females were time-screening adherent. NHB males were 1.52 times more likely to be adherent to CRC screening guidelines than NHB females (CI 1.03-2.25). Accordingly 29.3% and 17.0% of NHW and Hispanic males were time-screening adherent, respectively. Of note, the authors also report that among Blacks; increasing age, male sex, having a college degree and earning between $45,000 to $65,000 per year increased the odds of adherence to CRC screening. Finally, they report that Behavioral Risk Factor Surveillance System (BRFSS), and previous NHIS studies overestimate CRC screening adherence, at a rate of 53.1% and 40%, respectively. Their results report that true national adherence rates are 25.8%, much lower than previously reported, and are more accurate due to accounting for test purpose. Accordingly, true adherence rates among racial/ethnic minority populations are likely significantly lower as well.

Analysis

The aims of this analysis were very well defined, focused, and addressed significant issues in accurately measuring cancer screening adherence. Given the use of NHIS survey data, and use of probability sampling throughout all states, the sample population was nationally representative, and few exclusion criteria were enforced (age under 50 and history of colorectal cancer). Measures of the outcome (time only and time screening adherence) were clearly defined, and appropriate. The only point that was not clarified was the difference between "percentage of time-only adherent done for screening purposes" versus "people tested within the recommended time frame and for screening purposes. Presumably, these estimates are identical, however in their analyses they are not equal estimates.

Further, although adherence measures were reportedly guideline consistent, the specific ACS screening guidelines were not described, and all endoscopies were analyzed in aggregate (i.e. sigmoidoscopy, colonoscopy, and proctoscopy), precluding analysis stratified by endoscopy

type. A strength of this study included the rigorous differentiation between screen testing and non-screen testing. Additionally, it is not reported whether survey items were valid and reliable, or that interviews (face to face), were conducted to ensure inter-interviewing fidelity.

All statistical methods used appeared adequate and appropriate, and authors also accounted for missing data using multiple imputation methods and adjusted for relevant confounders in multivariate analyses. Sample size was large, particularly in comparison to other adherence studies, thus increasing the precision of the results.

Overall, this study offered several interesting and somewhat contradictory findings, compared to other previous analyses. The direction and magnitude of their results in regard to endoscopy use among NHB counters that of some previous analyses (i.e. they found a statistically significant higher use of screening endoscopy among NHB males and females compared to NHW males and females).

Further, there were no other statistically significant differences in CRC screening between NH Blacks and Whites, which is also contrary to some other nationally representative results. Unfortunately, as analyses were only stratified by race/ethnicity, and not by gender, one could not compare CRC screening rates between NHB and NHW males. More importantly, only overall CRC time-screening adherence among NHB males was measured (27.1%), and no analyses measured specific adherence stratified by screening method. Nonetheless, the magnitude of this result continues to underscore the disparity in screening among racial/ethnic minorities.

In sum, the overall quality of this study is good, with minimal threats to both internal and external validity. The large, nationally representative sample with few exclusion criteria, and a response

rate >90% limits the potential for significant selection bias. The rigorous methods to differentiate screening versus non-screening limits the potential for differential measurement bias of adherence, and their control for all potential confounders, strengthens results of multivariate analyses. There is a small amount of potential interviewer bias, as interviews were conducted face to face and authors do not describe how consistency and accuracy were maintained, though they report that all interviewers were trained at the US Bureau of the Census. Lastly, the use of self-report data has the potential to contribute a fair amount of bias, compared to more objective data (claims based or medical records). These results are generalizable to the national population and shed light on more specific colorectal cancer screening adherence rates among four racial/ethnic groups.

Summary of Ata et al.

This analysis by Ata et al., provides overall colorectal cancer screening adherence rates for Black males, but unfortunately does not provide more specific data stratified by method of screening. These results are only stratified by race/ethnicity. However, the authors have examined an important topic among a nationally representative population, and measured CRC screening adherence based on guidelines (American Cancer Society), using self-report data. Though, more screening method-specific data on Black males were not provided, this analysis provided the most well-defined analysis of true colorectal cancer screening adherence rates among several racial/ethnic groups in the US.

Taylor et al. 2003

Taylor et al. (22) examined colorectal cancer screening and the significance of physician recommendation among Blacks in Seattle, Washington. The aim of this cross-sectional study was to examine the impact of physician recommendation and certain beliefs on colorectal cancer screening participation among Blacks. In early 2002, 1,602 patients at an urban hospital-

affiliated primary care clinic were recruited and a total of 74 participants were included for final analysis.

Survey questionnaires developed by physicians and health care providers measured (1) ever having a FOBT (2) FOB testing in the past year (3) ever receiving flexible sigmoidoscopy (4) sigmoidoscopy in the last five years (5) ever receiving a colonoscopy and (5) receiving a colonoscopy in the past 10 years, based upon American College of Gastroenterologist and USPSTF guidelines. After participants were lost due to; loss to follow-up, age less than 50 years, and failure to complete the survey, 74 participants were included in the analysis. Based upon ACG and UPSTF CRC screening guidelines, 55% of all participants were adherent to screening, and 31% were adherent to "alternative" guidelines (FOBT in 12 months and sigmoidoscopy in five years or colonoscopy in 10 years). Specific results revealed that 34% of Black males received an FOBT in last year, 33% received a sigmoidoscopy in the last 5 years, and 33% received a colonoscopy in the last 10 years. Differences in screening rates between men and women were not statistically significant.

Analysis

The authors clearly defined both their study questions and sample population, however the final study sample was small and likely not representative of the sample population. Participants were recruited from an inner city, hospital affiliated primary care clinic, and were included if they were Black, 50-79 years of age, English speaking and visited the primary care clinic in the past 12 months. Though few patients were excluded based on eligibility criteria (n=2), nearly 15% could not be contacted, and 40% did not cooperate with the survey. It is unknown whether these individuals are inherently different from study participants.

Additionally, although colorectal cancer screening measures were consistent with guidelines, the authors did not exclude individuals with a prior history of colorectal cancer or polyps, and did not attempt to differentiate screening tests from non-screening tests. Moreover, the survey questionnaire, created by staff physicians and health care providers, was not reported as either reliable or valid. Statistical analyses, though minimally described, appeared to be appropriate, though the very small sample size decreases the precision and strength of their modeling results (not reviewed here). The reportedly low screening rates, among this urban population are consistent with the low screening rates identified with other previous analyses, however given the many potential threats to internal validity, these results may not be accurate.

As previously stated, the high loss to follow up and incomplete cooperation rate, significantly reduced the final number of participants, possibly losing a considerable proportion of individuals that may be different than those finally included. In addition, as the authors did not collect baseline data on (nor exclude) those with a history of prior colorectal cancer or polyps, individuals included may have greater than average risk for CRC screening, and falsely included high risk persons, further introducing selection bias. In addition, among study participants, this study did not examine the purpose for the test received, and measurement of adherence may have been overestimated, if individuals receiving follow-up or surveillance testing were falsely included in the screening group. Lastly, as with all of the studies described in this review, all data were self-report and subject to recall bias, which likely contributed a fair amount of bias. Overall, this study was of fair quality, at best.

Summary of Taylor et al.

Overall, this study did in fact provide data on guideline consistent colorectal cancer screening use among Blacks, albeit in a very specific population (inner city Seattle, WA). The adherence rates may have been overestimated, as true screening compared to non-screening test use was

not examined, and higher risk individuals may have been falsely included in the final analysis. Consistent with all the other studies reviewed, self-report data, without supporting medical record or claims-based data was used, and therefore this analysis does not provide a more objective estimate of colorectal cancer screening adherence among this high risk population.

Conclusion

The persistently elevated rates of colorectal cancer morbidity and mortality among Black men, compared to all other US adults highlights the need to investigate and address cancer screening disparities. Accordingly, in order to accurately address colorectal cancer screening disparities, we must verify the indication for testing, and exclude tests performed for diagnostic purposes. As stated, previously analyses suggest that racial/ethnic minorities tend to over-report colorectal cancer screening (Rauscher 2008), and the authors of one study, reviewed in this analysis, estimates that true overall colorectal cancer screening rates may be as low as 25.8% (Ata 2006). These estimates are not specific to Blacks, and are likely considerably lower among racial/ethnic minorities.

State of the Evidence

After reviewing the literature on colorectal cancer screening adherence among Blacks, it is evident that consistent, high quality, objective data are not yet available.

Of the seven studies reviewed, three were of good quality (Leone et al., Shavers et al., and Ata et al.). Of these three studies, only one (Leone et al.), provided fairly specific colorectal cancer screening rates among Black males, while Shavers et al., and Ata et al. reported general adherence rates and adjusted odds of screening stratified by race and ethnicity. Further, Leone et al. (as well as Palmer et al.) surprisingly reported higher CRC screening adherence rates among Black males than the national average. However, neither study fully (if at all)

differentiated screening versus non-screening test use, and both had study populations with higher SES and health care access than national estimates.

Nonetheless, Shavers et al. and Ata et al. made the best efforts of all studies reviewed, to examine true, guideline consistent screening versus testing for other purposes, and used nationally representative data. Both studies report that Black males had higher odds of receiving guideline consistent screening than Black females, yet comparisons across racial/ethnic groups could not be made, and as with all the other studies, only self-reported data was used. Lastly, though Leone et al. was of fairly good quality, only Blacks residing in specific counties in North Carolina or Michigan were measured, limiting generalizability.

Among the remaining four studies, Palmer et al., Lawsin et al., and Taylor et al. were all of fair quality, while Hood et al. ranged between poor and fair quality. These studies had the greatest potential for selection and measurement bias, and though some colorectal cancer screening adherence measures were consistent between these studies (i.e. FOBT adherence rates between 31 and 38%), these rates are likely overestimates given the methods used to measure adherence.

One consistency among all studies was the persistent heterogeneity in study population, sample size, comparison groups, measured screening methods, and reported adherence rates. Study populations ranged from nationally representative (Shavers et al., Ata et al.) to very specific, relatively higher risk urban populations (Lawsin et al., Taylor et al.), while sample sizes ranged from as few as 74 participants (Taylor et al.) to as many as 46,145 participants (Shavers et al.). Adherence rates among Black males were often compared to those of Black females, as analyses were stratified by race/ethnicity and not by gender as well.

Additionally, though ACS and USPSTF colorectal cancer screening guidelines were the most commonly used reference for screening, methods of screening varied. Some authors collected data on barium enema use, virtual colonoscopy and proctoscopy, while most focused on FOBT, sigmoidoscopy and colonoscopy.

There was also great variation in reported colorectal cancer screening adherence rates. Some studies (Leone et al., and Palmer et al.) reported CRC adherence rates greater than the national average, while Ata et al. reported time-screening adherence among Black males as low as 27.1%. Hood et al., Lawsin et al. and Taylor et al. had the most consistent FOBT adherence rates among Black males, reporting rates of 38%, 31% and 34%, respectively.

The most consistent factor between all studies, and conversely a limiting factor, was the failure to use more objective data to measure adherence. Collecting data via medical records or claims data, though cumbersome and not error-proof, would have strengthened all of the studies, and provided a more accurate estimation of true screening adherence.

Overall, given the wide range of adherence rates reported, populations examined, and screening methods measured, the results of this review underscore the importance of accurately, and consistently measuring colorectal cancer screening adherence among a high-risk population. Research that uses objective measures to validate nationally representative datasets is needed in order to better estimate the true prevalence of colorectal cancer screening among Black men.

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Table 1. Literature Summary Table

Study #	Study	Journal	Study Design	Sample Size	Sample Population	Screening Modality	Differentiates Screening from Non-Screening	Screening Guideline	Adherence Measures and Rates	AA Male CRC Adherence Rates
1	Leone (2012)	J Community Health	Cross-Sectional (Survey)	955 (n=284 Males)	**Age**: Over 50 **Race**: AA **Sex**: M, F **Community/Site**: Church members in Michigan and North Carolina	FOBT Sigmoidoscopy Colonoscopy Barium Enema Virtual Colonoscopy (DRE) (PSA)	Yes (But does not exclude testing for diagnostic purposes)	**2008 American Cancer Society Joint Guidelines** 1-FOBT in 1yr 2-Sigmoidoscopy in 5 yrs 3-Colonoscopy in 10 years 4-Barium Enema in 5 years 5-Virtual Colonoscopy in the past 5 yrs	**Self-Report** "CRC Screening" 1-Any test: **72.9%** 2-Colonoscopy only: **64.4%** 3-Stool test only: **12.7%** **"Up-to-date CRC testing"** 1-Screening: **60.7%** 2-Polyp Surveillance:68.2% 3-Screening or Surveillance:63.0%	Higher than Nat'l Avg
2	Palmer (2011)	J Community Health	Cross-Sectional (Telephone survey)	504 (n=252 males)	**Age**: Over 50 **Race**: AA **Sex**: M, F **Community**: Maryland residents	FOBT Barium enema Flexible Sigmoidoscopy Colonoscopy	No	**2008 American Cancer Society Joint Guidelines** 1-FOBT in 1yr 2-Sigmoidoscopy in 5 yrs 3-Colonoscopy in 10 years 4-Barium Enema in 5 years	**Self-Report** "CRC Adherent": **75.8%** FOBT in 1 y **N/A** BE in 5 yrs **N/A** FS in 5 yrs **N/A** Colonoscopy in 10 yrs **N/A**	Higher than Nat'l Average **75.8%**
3	Shavers (2010)	JNMA	Cross-Sectional (NHIS Cancer Control Supplement Modules and Sample Adult Core)	46,145	Age: Over 50 Race: AA, Hisp, NHW Sex: M,F Community: Nat'l representative	Home FOBT Sigmoidoscopy Colonoscopy Other/unknown endoscopy	Yes (excluded follow-up of abnormal tests, previous symptoms or other reasons.	**2008 American Cancer Society Joint Guidelines** 1-Home FOBT in last year 2-Sigmoidoscopy, other/unknown endoscopy in the last 5 yrs 3-Colonoscopy in the past 10 years	**Self-Report** 1-Ever had a colorectal FOBT exam 2-Guideline consistent screening 3-Most recent colorectal screening exam 4-Most recent and complete guideline consistent colorectal screening exam	**Adjusted Odds Ratio** of receiving guideline-consistent exam **OR=1.12 (0.95-1.32)** (referent-African American females) **Adherence rates/proportions for AA males not provided**
4	Hood (2010	J Canc Educ	Cross-Sectional	439 (n=20	**Age**: 45-75yrs (analyses on	1-FOBT: <1yr, 1-2y,	No	**American Cancer**	**Self-Report** 1-Ever screened	Adherent to CRC

	)		(National Cancer Institute Colorectal Cancer Screening Questionnaire)	4 Males)	ages 50yrs and older) **Race**: AA **Sex**: M,F **Community**: Residents of the St. Louis Standard Metropolitan Statistical Areas	2-5y, unknown 2-Sigmoidoscopy 3-Colonoscopy <1, 1-5yrs, 5-10y, >10yrs, unknown		**Society 1997 Update** **USPSTF 2008**	for CRC 2-Ever rec'd FOBT 3-Ever rec'd sigmoidoscopy 4-Ever rec'd colonoscopy	guidelines: **58.9%** FOBT: **38%** Sigmoidoscopy: ~**25%** Colonoscopy: **49%** (unclear whether this is guideline consistent, and what time frames these are referring to)
5	Lawsin (2007)	J Urban Health	Cross-Sectional (Telephone or Face to face survey)	111 (n=48 Males)	**Age:** >51yr **Race**: AA **Sex**: M,F Community: Urban hospital ambulatory care center patients	1-FOBT 2-Flexible sigmoidoscopy	No	**2005 American Cancer Society CRC Screening Guidelines**	**Self-Report** 1-FOBT in 1 yr 2-Flex sigmoidoscopy in 5 yrs	FOBT: **31.3%** FS: **10.1%**
6	Ata (2006)	Cancer Detection and Prevention	Cross-Sectional (2000 National Health Interview Survey)	9322	**Age**: >50 **Race**: Black, White, Hispanic **Sex:** M,F **Community**: Nationally representative sample	Home FOBT Endoscocopy	Yes	**American Cancer Society 2003**	**Self-Report** 1-Had the test done ever 2-Done within the recommended time period for any reason (time-only adherence 3-Done within the recommended time period for screening purposes only (time-screening adherence)	Time-Screening Adherent: **27.1%** Adjusted OR for time-screening adherence AA Males: 1.52 (compared to the referent AA females) 95% CI (1.03, 2.25)
7	Taylor (2003)	JNMA	Cross-sectional (Mail, telephone survey)	74	**Age:** 50-79 **Race:** AA **Sex**: M,F **Community**: Inner city Seattle, Washington, hospital affiliated primary care clinic	FOBT Sigmoidoscopy Colonoscopy	No	**American College of Gastroenterology 2000** **USPSTF 1996**	**Self-Report** 1-FOBT in last 12mos 2-Sigmoidoscopy in last 5yrs 3-Colonoscopy in the last 10yrs	FOBT ever: 59% FOBT last year: 34% Sigmoidoscopy last 5yrs: 33% Colonoscopy last 10 years:33%

Table 2. Quality Analysis

Study #	Study	Study Design	Sample Population (Location)	Selection Bias	Measurement Bias	Recall Bias	Confounding	Results:	Internal Validity	External Validity	Overall Quality
1	**Leone 2012**	Cross-Sectional	Narrow (Michigan, North Carolina)	Fair	Fair	Fair	Minimal	**(See Table 1. "Summary Table" for Magnitude and Precision)**	Fair-Good	Fair	Good
2	**Palmer 2011**	Cross-Sectional	Narrow (Maryland)	Moderate	Moderate	Fair	Fair		Fair	Poor	Fair
3	**Shavers 2010**	Cross-Sectional	Nationally Representative	Minimal	Minimal	Fair	Minimal		Good	Good	Good
4	**Hood 2010**	Cross-Sectional	Narrow (St. Louis, Missouri)	Fair	Moderate	Fair	Minimal		Poor	Good	Poor-Fair
5	**Lawsin 2006**	Cross-Sectional	Narrow (East Harlem, NY)	Fair	Moderate	Fair	Minimal		Fair	Poor	Fair
6	**Ata 2006**	Cross-Sectional	Nationally Representative	Minimal	Minimal	Fair	Minimal		Good	Good	Good
7	**Taylor 2003**	Cross-Sectional	Narrow (Seattle, Washington)	Moderate	Moderate	Fair	Minima		Fair	Poor	Fair

Assessment of Bias: Minimal<Fair<Moderate<Significant
Quality: Poor<Fair<Good